

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference SP/N9940	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/GB 00/ 02461	International filing date (day/month/year) 27/06/2000	(Earliest) Priority Date (day/month/year) 30/06/1999
Applicant WORLD GOLF SYSTEMS LTD et al.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

☐ as suggested by the applicant.

☒ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

2

☐ None of the figures.

Page 00/02461

IPC 7 A63B43/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A63B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EP0-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 582 550 A (FOLEY THOMAS P) 10 December 1996 (1996-12-10)	1,8,9
A	column 2, line 53 -column 3, line 13; figures 3A,3B ---	2-7
X	US 3 782 730 A (HORCHLER S) 1 January 1974 (1974-01-01) cited in the application	1,2
A	column 1, line 19 -column 2, line 12 column 2, line 23 -column 3, line 11; figures 1-3 ---	3-9
X	US 5 910 057 A (QUIMBY ET AL) 8 June 1999 (1999-06-08)	1.
A	column 3, line 41 -column 4, line 7; figures 3-6 ---	2-8
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☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

P document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention.

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

11 October 2000

Date of mailing of the international search report

19/10/2000

Name and mailing address of the ISA
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Authorized officer

Levert, C

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 00/02461

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 743 815 A (HELDERMAN MICHAEL D) 28 April 1998 (1998-04-28) cited in the application	1
A	column 3, line 3 -column 4, line 11; figures 1-3 -----	2-8

INTERNATIONAL SEARCH REPORT

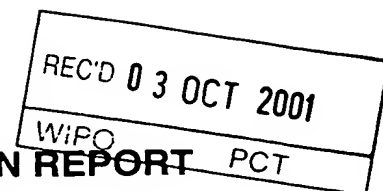
Information on patent family members

International Application No

PCT/GB 00/02461

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5582550 ✓ A	10-12-1996	US 5487542 A EP 0817663 A WO 9629124 A	30-01-1996 14-01-1998 26-09-1996
US 3782730 ✓ A	01-01-1974	NONE	
US 5910057 ✓ A	08-06-1999	NONE	
US 5743815 ✓ A	28-04-1998	NONE	

(PCT Article 36 and Rule 70)



Applicant's or agent's file reference SP/MH/N9940	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/GB00/02461	International filing date (day/month/year) 27/06/2000	Priority date (day/month/year) 30/06/1999
International Patent Classification (IPC) or national classification and IPC A63B43/00		
Applicant WORLD GOLF SYSTEMS LTD et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.



2. This REPORT consists of a total of 4 sheets, including this cover sheet.

- ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 7 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 26/01/2001	Date of completion of this report 01.10.2001
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Teusch, R Telephone No. +49 89 2399 7827 

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB00/02461

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*):

Description, pages:

3	as originally filed			
4,5	as received on	18/06/2001	with letter of	15/06/2001
1,2	as received on	13/08/2001	with letter of	10/08/2001

Claims, No.:

8,9	as received on	18/06/2001	with letter of	15/06/2001
1-7	as received on	13/08/2001	with letter of	10/08/2001

Drawings, sheets:

1/2,2/2	as originally filed
---------	---------------------

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/GB00/02461

listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages: _____
☐ the claims, Nos.: _____
☐ the drawings, sheets: _____

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims 1-9
	No: Claims
Inventive step (IS)	Yes: Claims 1-9
	No: Claims
Industrial applicability (IA)	Yes: Claims 1-9
	No: Claims

2. Citations and explanations
see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/GB00/02461

Re Item V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

The invention relates to a golf ball with an identification device embedded in its core and the method for producing such a golf ball.

A golf ball with the features of the preamble of claim 1 is known from US-A-3 782 730.

The technical problem can be defined as to provide a golf ball in which the identification device embedded in the core is better protected against mechanical shocks.

The solution is achieved by first fixing the parts of the identification device (coded element and aerial) to a spring or diaphragm before embedding them into the core.

In the available prior art the identification device is either directly embedded in the core (US-A-5 582 550) or first introduced into a spherical mass (US-A-3 782 730) but no document teaches or suggests an additional fixation on a resilient member as for example a diaphragm. Therefore, the subject-matter of claims 1 and 8 meets the requirements of Article 33(2) and (3) PCT.

Dependent claims 2-7 and 9 define further embodiments and likewise meet the requirements of Article 33(2) and (3) PCT.



To:

POWELL, Stephen David
WILLIAMS, POWELL & ASSOCIATES
4 St.Paul's Churchyard
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GRANDE BRETAGNE

NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL PRELIMINARY
EXAMINATION REPORT

(PCT Rule 71.1)

Date of mailing
(day/month/year) 01.10.2001

Applicant's or agent's file reference
SP/MH/N9940

IMPORTANT NOTIFICATION

International application No.
PCT/GB00/02461

International filing date (day/month/year)
27/06/2000

Priority date (day/month/year)
30/06/1999

Applicant
WORLD GOLF SYSTEMS LTD et al.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.


4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/

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Fax: +49 89 2399 - 4465

Authorized officer

Goenechea Olmos, A



Tel.+49 89 2399-2664



PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference SP/MH/N9940		FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/GB00/02461	International filing date (day/month/year) 27/06/2000	Priority date (day/month/year) 30/06/1999	
International Patent Classification (IPC) or national classification and IPC A63B43/00			
Applicant WORLD GOLF SYSTEMS LTD et al.			
<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 4 sheets, including this cover sheet.</p> <p><input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of 7 sheets.</p>			
<p>3. This report contains indications relating to the following items:</p> <ul style="list-style-type: none"> I <input checked="" type="checkbox"/> Basis of the report II <input type="checkbox"/> Priority III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability IV <input type="checkbox"/> Lack of unity of invention V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement VI <input type="checkbox"/> Certain documents cited VII <input type="checkbox"/> Certain defects in the international application VIII <input type="checkbox"/> Certain observations on the international application 			
Date of submission of the demand 26/01/2001		Date of completion of this report 01.10.2001	
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465		Authorized officer Teusch, R Telephone No. +49 89 2399 7827 	

I. Basis of the report

1. With regard to the elements of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, pages:

3	as originally filed			
4,5	as received on	18/06/2001	with letter of	15/06/2001
1,2	as received on	13/08/2001	with letter of	10/08/2001

Claims, No.:

8,9	as received on	18/06/2001	with letter of	15/06/2001
1-7	as received on	13/08/2001	with letter of	10/08/2001

Drawings, sheets:

1/2,2/2	as originally filed
---------	---------------------

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

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- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence

listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-9
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-9
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-9
	No:	Claims	

**2. Citations and explanations
see separate sheet**

Re Item V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

The invention relates to a golf ball with an identification device embedded in its core and the method for producing such a golf ball.

A golf ball with the features of the preamble of claim 1 is known from US-A-3 782 730.

The technical problem can be defined as to provide a golf ball in which the identification device embedded in the core is better protected against mechanical shocks.

The solution is achieved by first fixing the parts of the identification device (coded element and aerial) to a spring or diaphragm before embedding them into the core.

In the available prior art the identification device is either directly embedded in the core (US-A-5 582 550) or first introduced into a spherical mass (US-A-3 782 730) but no document teaches or suggests an additional fixation on a resilient member as for example a diaphragm. Therefore, the subject-matter of claims 1 and 8 meets the requirements of Article 33(2) and (3) PCT.

Dependent claims 2-7 and 9 define further embodiments and likewise meet the requirements of Article 33(2) and (3) PCT.

The present invention relates to balls, especially golf balls, incorporating an identification device.

U.S. patent 5,743,815 discloses such an arrangement, in which a passive transponder is surrounded by elastic material and a rigid housing to produce a coded golf ball. GB patent 1,172,449 discloses a radio emitter arranged in the liquid composition at the centre of a golf ball. U.S. 5582550 discloses a golf ball having embedded therein an identification device and an aerial.

U.S. 3,782,730 also shows a golf ball with an oscillator circuit which is surrounded by a resilient sphere and which is to aid location of the ball. The circuit is set in a resin mass which is located in a rubber core. The disclosure of this document corresponds generally to the introduction of claims 1 and 8.

Coded golf balls are necessary in order to efficiently run golf driving ranges such as those disclosed in our co-pending patent application PCT/GB99/00883.

A problem with prior arrangements is to provide a sufficiently reliable identification device which is robust enough to withstand the shock of repeated impacts with a golf club. Another problem is the need to withstand the extreme conditions of temperature and pressure required during the manufacture of golf balls. In addition the identification device should have no effect on the performance of the golf ball in use.

The present invention seeks to overcome or reduce one or more of the above problems.

According to a first aspect of the present invention, a golf ball comprising a core with an identification device embedded in the core, the identification device comprising a coded element and an aerial characterised in that the identification device further comprises a spring or diaphragm and in that the coded element and/or the

aerial, to dampen mechanical shocks thereto, are connected to the spring or diaphragm.

The identification device is preferably a radio frequency identification device.

The coded element may be mounted in or on a plate with the aerial being formed by a coil arranged on one face of the plate and the diaphragm being arranged on the opposite face of the plate.

In preferred arrangements the coded element, in the form of a chip, is connected to the diaphragm. The aerial coil is separately connected to the diaphragm, so that the diaphragm may also serve to electrically connect the chip and the aerial coil.

The spring or diaphragm is preferably made of a heat conductive material so that it can serve as a heat sink during subsequent manufacturing stages of the golf ball to prevent overheating of the coded element and/or the aerial.

According to a second aspect of the present invention, there is provided a method of manufacturing a golf ball incorporating an identification device, the method including the steps of moulding the identification device in a disc or capsule member, placing the member between two parts of a ball core, adhering the core parts to each other around the member, and then subjecting the thus-formed core to further processing steps, including providing it with a covering, characterised in that means for protecting the identification device from the effects of impacts are also moulded in the disc or capsule member.

The core parts are preferably symmetrical and may be hemispherical or cuboid shape (to form a cuboid core which is subsequently processed to have a spherical shape).

Preferred embodiments of the present invention will now be described, by way of example only, with reference to the accompanying drawings, of which:

Figure 1 shows a top plan view of an identification device for use in an embodiment of the present invention;

The plate 11, with the various components mounted thereon, is then located in a mould, and epoxy resin material 17 is then cast around it to form a disc member or capsule 20, Figure 3. The capsule provides high impact absorption and bonding for the plate arranged substantially along its central plane. As the material of the capsule sets, the difference between the thermal setting properties of the different materials enables the diaphragm to "set-back", giving room for relative movement after setting. Typical maximum dimensions of the capsule are diameter 17mm and depth 3.5mm.

As shown in Figures 4a and 4b, the capsule 20 is then positioned within a pre-manufactured soft synthetic rubber billet or core 35 of generally cuboid shape. This is done by slicing the billet in half, cleaning the cut surfaces with solvent, coating the capsule with a bonding solution to improve adhesion and to prevent delamination, placing the capsule carefully at the centre of the billet 35, and bonding the two halves of the billet together again. Here, it is important that the capsule 20 is located centrally of the loaded synthetic rubber/chalk pre-manufactured core 35. This can be done manually or automatically with a specially-designed tool. The capsule 20 should be oriented with its major surfaces parallel to the major surfaces of the core 35.

The accurate location of the capsule 20 within each billet half, can be assisted by cutting or machining an appropriately shaped recess.

The billet is then subjected to a conventional manufacturing process during which it reaches temperatures of 200°C and pressures of up to 15.4 MN/m² (1ton/square inch) as the rubber compound vulcanises and adopts a spherical form 35', Figure 5. During the heating process, the diaphragm 16 further serves as a heat sink for the chip 12 and the rest of the identification device, which is thus prevented from thermal damage. A conventional dimpled cover of material sold under the trade name of Surlyn or similar material is subsequently applied as the outer layer of the ball.

A ball manufactured as above is within the normal weight specification (maximum 45.93 grams) and performs exactly as a normal ball, i.e. it looks and feels the same and the

presence of the identification device does not affect the flight, trajectory, run, distance or dispersion of the ball in use.

In addition, alternative arrangements may be provided for absorbing shocks. For example, in one modification, electronic circuitry is mounted on an aerial coil which in turn is mounted on a spring.

The identification system could be used in other sorts of balls, e.g. tennis balls, or any other type of object which undergoes rough treatment.

Instead of uniquely identifying the ball or other object, the device may simply be part of a presence-sensing system, e.g. as an aid to locating lost golf balls.

CLAIMS

1. A golf ball comprising a core (35) with an identification device (10) embedded in the core, the identification device comprising a coded element (12) and an aerial (14) characterised in that the identification device (10) further comprises a spring or diaphragm (16) and in that the coded element (12) and/or the aerial (14), to dampen mechanical shocks thereto, are connected to the spring or diaphragm(16).
2. A golf ball according to claim 1, wherein the identification device (10) is a radio frequency identification device.
3. A golf ball according to claims 1 or 2, wherein the coded element is mounted in or on a plate (11), with the aerial being formed by a coil arranged on one face of the plate and the diaphragm (16) being arranged on the opposite face of the plate.
4. A golf ball according to any preceding claim, wherein the coded element is a chip (12) which is connected to the diaphragm (16).
5. A golf ball according to claim 4, wherein the aerial (14) is separately connected to the diaphragm (16).
6. A golf ball according to any preceding claim wherein the spring or diaphragm (16) is heat conductive.
7. A golf ball according to claim 6, wherein the material is steel.
- ~~8. A method of manufacturing a golf ball incorporating an identification device (10), the method including the steps of moulding the identification device in a disc or capsule member (20), placing the member (20) between two parts of a ball core (35), adhering the core parts to each other around the member (20), and then~~

CLAIMS

1. A golf ball comprising a core (35) with an identification device (10) embedded in the core, the identification device comprising a coded element (12) and an aerial (14) characterised in that the identification device (10) further comprises a resilient member (16) and in that the coded element (12) and/or the aerial (14), to dampen mechanical shocks thereto, are connected to the resilient member (16).
2. A golf ball according to claim 1, wherein the identification device (10) is a radio frequency identification device.
3. A golf ball according to claims 1 or 2, wherein the coded element is mounted in or on a plate (11), with the aerial being formed by a coil arranged on one face of the plate and the resilient member being arranged on the opposite face of the plate.
4. A golf ball according to any preceding claim, wherein the resilient member is in the form of a diaphragm (16) and the coded element is a chip (12) which is connected to the diaphragm.
5. A golf ball according to claim 4, wherein the aerial (14) is separately connected to the diaphragm.
6. A golf ball according to any preceding claim wherein the resilient member (16) is heat conductive.
7. A golf ball according to claim 6, wherein the material is steel.
8. A method of manufacturing a golf ball incorporating an identification device (10), the method including the steps of moulding the identification device in a disc or capsule member (20), placing the member (20) between two parts of a ball core (35), adhering the core parts to each other around the member (20), and then

subjecting the thus-formed core to further processing steps, including providing it with a covering, characterised in that means (16) for protecting the identification device from the effects of impacts are also moulded in the disc or capsule member.

9. A method according to claim 8, wherein the core parts form a core (35) of cuboid shape and are subsequently processed to have a spherical shape (35').

2/PRTS₁

10/019767

**REPLACED BY
ART 34 AMDT**GOLF BALLS**531 Rec'd PCT/PT 28 DEC 2001**

The present invention relates to balls, especially golf balls, incorporating an identification device.

U.S. patent 5,743,815 discloses such an arrangement, in which a passive transponder is surrounded by elastic material and a rigid housing to produce a coded golf ball. U.S. 3,782,730 also shows a golf ball with an oscillator circuit which is surrounded by a resistant sphere and which is to aid location of the ball. GB patent 1,172,449 discloses a radio emitter arranged in the liquid composition at the centre of a golf ball.

Coded golf balls are necessary in order to efficiently run golf driving ranges as those disclosed in our co-pending patent application PCT/GB99/00883.

A problem with prior arrangements is to provide a sufficiently reliable identification device which is robust enough to withstand the shock of repeated impacts with a golf club. Another problem is the need to withstand the extreme conditions of temperature and pressure required during the manufacture of golf balls. In addition the identification device should have no effect on the performance of the golf ball in use.

The present invention seeks to overcome or reduce one or more of the above problems.

According to a first aspect of the present invention, there is provided a golf ball having an identification device embedded therein, the identification device comprising a coded element and an aerial, wherein the coded element and/or the aerial is/are associated with a resilient member arranged to dampen mechanical shocks thereto.

The identification device is preferably a radio frequency identification device.

The coded element may be mounted in or on a plate with the aerial being formed by a coil arranged on one face of the plate and the resilient member being arranged on the opposite face of the plate.

In preferred arrangements the resilient member is in the form of a diaphragm and the coded element, in the form of a chip, is connected to the diaphragm. The aerial coil is separately connected to the diaphragm, so that the diaphragm may also serve to electrically connect the chip and the aerial coil.

The resilient member is preferably made of such a material that it can serve as a heat sink during subsequent manufacturing stages of the golf ball to prevent overheating of the coded element and/or the aerial.

According to a second aspect of the present invention, there is provided a method of manufacturing a golf ball incorporating an identification device, the method including the steps of moulding the identification device in a disc member, placing the disc member between two parts of a ball core, adhering the core parts to each other around the disc member, and then subjecting the thus-formed core to further processing steps, including providing it with a covering.

The core parts are preferably symmetrical and may be hemispherical of cuboid shape (to form a cuboid core which is subsequently processed to have a spherical shape).

Means for protecting the identification device from the effects of impacts are preferably also moulded in the disc member.

Preferred embodiments of the present invention will now be described, by way of example only, with reference to the accompanying drawings, of which:

Figure 1 shows a top plan view of an identification device for use in an embodiment of the present invention;

Figure 2 shows a bottom plan view of the device of Figure 1;

Figure 3 shows the device of Figures 1 and 2 encapsulated in a capsule;

Figure 4a and 4b show the device of Figure 3 is embedded in a core of cuboid shape; and

Figure 5 shows the core of Figure 4 after a further processing step.

Referring to the drawings, Figures 1 and 2 show an identification device 10 comprising a substrate formed by an insulating plate 11 e.g. of a plastics material such as any polyvinyl chloride product with the necessary temperature characteristics. The identification device is a passive device and includes an ASIC chip 12 with a 64 bit memory which can be read only or may have both read and write functions. The device operates at radio frequency preferably in the range 66kHz - 13.56 MHz. It also comprises a generally circular copper coil aerial 14 and arranged to receive interrogation signals from external readers and to transmit an appropriate response. The code within the coded response of the aerial 14 is stored in the memory of chip 12.

On the opposite major surface of plate 11, there is provided an annular or coiled shock absorbing member in the form of a steel diaphragm 16. Diaphragm 16 has a tongue 18 and a meandering section or castellation 19 which assists in bonding to the plate 11. The diaphragm is resiliently mounted, e.g. on a spring part, so as to protect the identification device from the impact of a golf club.

The physical arrangement is such that the chip 12 is mounted on the back of tongue 18 of the diaphragm 16 as seen in Figure 2; this enables the diaphragm to act as an effective heat sink for chip 12 during processing of the core. The chip 12 extends through a hole 22 in the plate 11 but without being directly attached to the plate. The aerial coil 14 is separately attached to the diaphragm 16 by a connection passing through the plate 11; this means that the diaphragm can serve as a conductive link for signals passing between aerial 14 and chip 12.

The plate 11, with the various components mounted thereon, is then located in a mould, and epoxy resin material 17 is then cast around it to form a disc member or capsule 20, Figure 3. The capsule provides high impact absorption and bonding for the plate arranged substantially along its central plane. As the material of the capsule sets, the difference between the thermal setting properties of the different materials enables the diaphragm to "set-back", giving room for relative movement after setting. Typical maximum dimensions of the capsule are diameter 17mm and depth 3.5mm.

As shown in Figures 4a and 4b, the capsule 20 is then positioned within a pre-manufactured soft synthetic rubber billet or core 35 of generally cuboid shape. This is done by slicing the spherical billet in half, cleaning the cut surfaces with solvent, coating the capsule with a bonding solution to improve adhesion and to prevent delamination, placing the capsule carefully at the centre of the billet 35, and bonding the two halves of the billet together again. Here, it is important that the capsule 20 is located centrally of the loaded synthetic rubber/chalk pre-manufactured core 35. This can be done manually or automatically with a specially-designed tool. The capsule 20 should be oriented with its major surfaces parallel to the major surfaces of the core 35.

The accurate location of the capsule 20 within each billet half, can be assisted by cutting or machining an appropriately shaped recess.

The billet is then subjected to a conventional manufacturing process during which it reaches temperatures of 200°C and pressures of up to 15.4 MN/m² (1ton/square inch) as the rubber compound vulcanises and adopts a spherical form 35', Figure 5. During the heating process, the diaphragm 16 further serves as a heat sink for the chip 12 and the rest of the identification device, which is thus prevented from thermal damage. A conventional dimpled cover of material sold under the trade name of Surllyn or similar material is subsequently applied as the outer layer of the ball.

A ball manufactured as above is within the normal weight specification (maximum 45.93 grams) and performs exactly as a normal ball, i.e. it looks and feels the same and the

presence of the identification device does not affect the flight, trajectory, run, distance or dispersion of the ball in use.

In addition, alternative arrangements may be provided for absorbing shocks. For example, in one modification, electronic circuitry is mounted on an aerial coil which in turn is mounted on a spring.

The identification system could be used in other sorts of balls, e.g. tennis balls, or any other type of object which undergoes rough treatment.

Instead of uniquely identifying the ball or other object, the device may simply be part of a presence-sensing system, e.g. as an aerial to locating lost golf balls.

CLAIMS

1. A golf ball having an identification device (10) embedded therein, the identification device comprising a coded element (12) and an aerial (14), wherein the coded element and/or the aerial is/are associated with a resilient member (16) arranged to dampen mechanical shocks thereto.
2. A golf ball according to claim 1, wherein the identification device (10) is a radio frequency identification device.
3. A golf ball according to claims 1 or 2, wherein the coded element is mounted in or on a plate (11), with the aerial being formed by a coil arranged on one face of the plate and the resilient member being arranged on the opposite face of the plate.
4. A golf ball according to any preceding claim, wherein the resilient member is in the form of a diaphragm (16) and the coded element is a chip (12) which is connected to the diaphragm.
5. A golf ball according to claim 4, wherein the aerial (14) is separately connected to the diaphragm.
6. A golf ball according to any preceding claim wherein the resilient member (16) is made of such a material that it can serve as a heat sink.
7. A golf ball according to claim 6, wherein the material is steel.
8. A method of manufacturing a golf ball incorporating an identification device (10), the method including the steps of moulding the identification device in a disc or capsule member (20), placing the member (20) between two parts of a ball core (35), adhering the core parts to each other around the member (20), and then

subjecting the thus-formed core to further processing steps, including providing it with a covering.

9. A method according to claim 8 wherein the core parts are symmetrical.
10. A method according to claim 9, wherein the core parts form a core (35) of cuboid shape and are subsequently processed to have a spherical shape (35').
11. A method according to any of claims 8 to 10, wherein means (16) for protecting the identification device from the effects of impacts are also moulded in the disc member.

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/GOLF BALLS/

The present invention relates to balls, especially golf balls, incorporating an identification device.

U.S. patent 5,743,815 discloses such an arrangement, in which a passive transponder is surrounded by elastic material and a rigid housing to produce a coded golf ball. GB patent 1,172,449 discloses a radio emitter arranged in the liquid composition at the centre of a golf ball. U.S. 5582550 discloses a golf ball having embedded therein an identification device and an aerial.

U.S. 3,782,730 also shows a golf ball with an oscillator circuit which is surrounded by a resilient sphere and which is to aid location of the ball. The circuit is set in a resin mass which is located in a rubber core. The disclosure of this document corresponds generally to the introduction of claims 1 and 8.

Coded golf balls are necessary in order to efficiently run golf driving ranges such as those disclosed in our co-pending patent application PCT/GB99/00883.

A problem with prior arrangements is to provide a sufficiently reliable identification device which is robust enough to withstand the shock of repeated impacts with a golf club. Another problem is the need to withstand the extreme conditions of temperature and pressure required during the manufacture of golf balls. In addition the identification device should have no effect on the performance of the golf ball in use.

The present invention seeks to overcome or reduce one or more of the above problems.

According to a first aspect of the present invention, a golf ball comprising a core with an identification device embedded in the core, the identification device comprising a coded element and an aerial characterised in that the identification device further comprises a spring or diaphragm and in that the coded element and/or the

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aerial, to dampen mechanical shocks thereto, are connected to the spring or diaphragm.

The identification device is preferably a radio frequency identification device.

The coded element may be mounted in or on a plate with the aerial being formed by a coil arranged on one face of the plate and the diaphragm being arranged on the opposite face of the plate.

In preferred arrangements the coded element, in the form of a chip, is connected to the diaphragm. The aerial coil is separately connected to the diaphragm, so that the diaphragm may also serve to electrically connect the chip and the aerial coil.

The spring or diaphragm is preferably made of a heat conductive material so that it can serve as a heat sink during subsequent manufacturing stages of the golf ball to prevent overheating of the coded element and/or the aerial.

According to a second aspect of the present invention, there is provided a method of manufacturing a golf ball incorporating an identification device, the method including the steps of moulding the identification device in a disc or capsule member, placing the member between two parts of a ball core, adhering the core parts to each other around the member, and then subjecting the thus-formed core to further processing steps, including providing it with a covering, characterised in that means for protecting the identification device from the effects of impacts are also moulded in the disc or capsule member.

The core parts are preferably symmetrical and may be hemispherical or cuboid shape (to form a cuboid core which is subsequently processed to have a spherical shape).

Preferred embodiments of the present invention will now be described, by way of example only, with reference to the accompanying drawings, of which:

Figure 1 shows a top plan view of an identification device for use in an embodiment of the present invention;

The plate 11, with the various components mounted thereon, is then located in a mould, and epoxy resin material 17 is then cast around it to form a disc member or capsule 20, Figure 3. The capsule provides high impact absorption and bonding for the plate arranged substantially along its central plane. As the material of the capsule sets, the difference between the thermal setting properties of the different materials enables the diaphragm to "set-back", giving room for relative movement after setting. Typical maximum dimensions of the capsule are diameter 17mm and depth 3.5mm.

As shown in Figures 4a and 4b, the capsule 20 is then positioned within a pre-manufactured soft synthetic rubber billet or core 35 of generally cuboid shape. This is done by slicing the billet in half, cleaning the cut surfaces with solvent, coating the capsule with a bonding solution to improve adhesion and to prevent delamination, placing the capsule carefully at the centre of the billet 35, and bonding the two halves of the billet together again. Here, it is important that the capsule 20 is located centrally of the loaded synthetic rubber/chalk pre-manufactured core 35. This can be done manually or automatically with a specially-designed tool. The capsule 20 should be oriented with its major surfaces parallel to the major surfaces of the core 35.

The accurate location of the capsule 20 within each billet half, can be assisted by cutting or machining an appropriately shaped recess.

The billet is then subjected to a conventional manufacturing process during which it reaches temperatures of 200°C and pressures of up to 15.4 MN/m² (1ton/square inch) as the rubber compound vulcanises and adopts a spherical form 35', Figure 5. During the heating process, the diaphragm 16 further serves as a heat sink for the chip 12 and the rest of the identification device, which is thus prevented from thermal damage. A conventional dimpled cover of material sold under the trade name of Surlyn or similar material is subsequently applied as the outer layer of the ball.

A ball manufactured as above is within the normal weight specification (maximum 45.93 grams) and performs exactly as a normal ball, i.e. it looks and feels the same and the

presence of the identification device does not affect the flight, trajectory, run, distance or dispersion of the ball in use.

In addition, alternative arrangements may be provided for absorbing shocks. For example, in one modification, electronic circuitry is mounted on an aerial coil which in turn is mounted on a spring.

The identification system could be used in other sorts of balls, e.g. tennis balls, or any other type of object which undergoes rough treatment.

Instead of uniquely identifying the ball or other object, the device may simply be part of a presence-sensing system, e.g. as an aid to locating lost golf balls.

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CLAIMS

1. A golf ball comprising a core (35) with an identification device (10) embedded in the core, the identification device comprising a coded element (12) and an aerial (14) characterised in that the identification device (10) further comprises a resilient member (16) and in that the coded element (12) and/or the aerial (14), to dampen mechanical shocks thereto, are connected to the resilient member (16).
2. A golf ball according to claim 1, wherein the identification device (10) is a radio frequency identification device.
3. A golf ball according to claims 1 or 2, wherein the coded element is mounted in or on a plate (11), with the aerial being formed by a coil arranged on one face of the plate and the resilient member being arranged on the opposite face of the plate.
4. A golf ball according to any preceding claim, wherein the resilient member is in the form of a diaphragm (16) and the coded element is a chip (12) which is connected to the diaphragm.
5. A golf ball according to claim 4, wherein the aerial (14) is separately connected to the diaphragm.
6. A golf ball according to any preceding claim wherein the resilient member (16) is heat conductive.
7. A golf ball according to claim 6, wherein the material is steel.
8. A method of manufacturing a golf ball incorporating an identification device (10), the method including the steps of moulding the identification device in a disc or capsule member (20), placing the member (20) between two parts of a ball core (35), adhering the core parts to each other around the member (20), and then

CLAIMS

1. A golf ball comprising a core (35) with an identification device (10) embedded in the core, the identification device comprising a coded element (12) and an aerial (14) characterised in that the identification device (10) further comprises a spring or diaphragm (16) and in that the coded element (12) and/or the aerial (14), to dampen mechanical shocks thereto, are connected to the spring or diaphragm (16).
2. A golf ball according to claim 1, wherein the identification device (10) is a radio frequency identification device.
3. A golf ball according to claims 1 or 2, wherein the coded element is mounted in or on a plate (11), with the aerial being formed by a coil arranged on one face of the plate and the diaphragm (16) being arranged on the opposite face of the plate.
4. A golf ball according to any preceding claim, wherein the coded element is a chip (12) which is connected to the diaphragm (16).
5. A golf ball according to claim 4, wherein the aerial (14) is separately connected to the diaphragm (16).
6. A golf ball according to any preceding claim wherein the spring or diaphragm (16) is heat conductive.
7. A golf ball according to claim 6, wherein the material is steel.
8. A method of manufacturing a golf ball incorporating an identification device (10), the method including the steps of moulding the identification device in a disc or capsule member (20), placing the member (20) between two parts of a ball core (35), adhering the core parts to each other around the member (20), and then

subjecting the thus-formed core to further processing steps, including providing it with a covering, characterised in that means (16) for protecting the identification device from the effects of impacts are also moulded in the disc or capsule member.

9. A method according to claim 8, wherein the core parts form a core (35) of cuboid shape and are subsequently processed to have a spherical shape (35').

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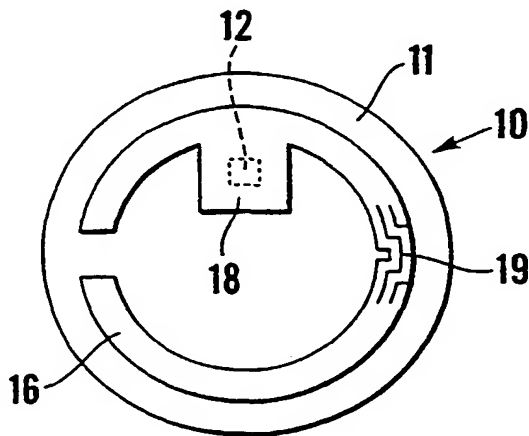
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(54) Title: **GOLF BALLS**



(57) Abstract: A golf ball having an identification device (10) embedded in it comprises an aerial (14) and a coded chip (12), which are associated with a resilient member (16) arranged to dampen shock from impact. The resilient members is in the form of a diaphragm (16), to which the chip (12) and aerial (14) are separately connected. The above components, mounted on an insulating plate (11), are moulded in a capsule (20) which is then placed at the centre of a golf ball core.

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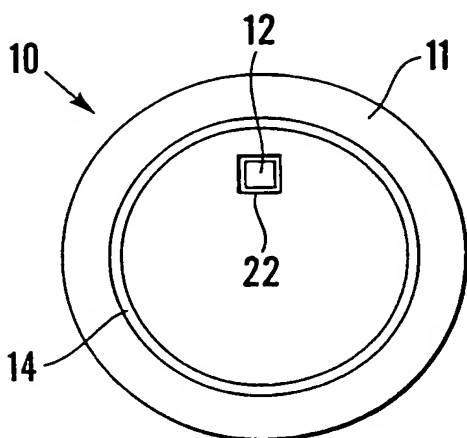


Fig. 1

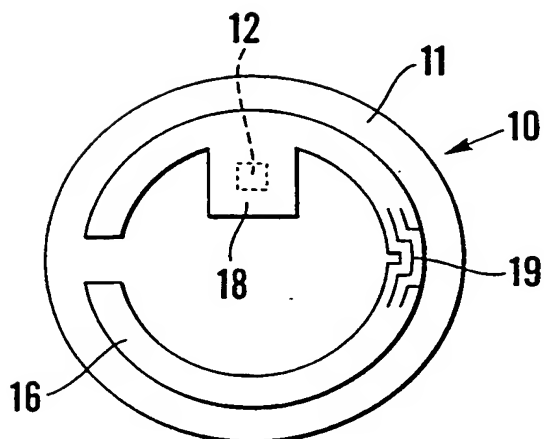


Fig. 2

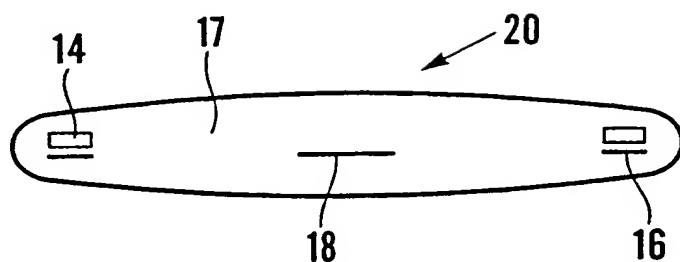


Fig. 3

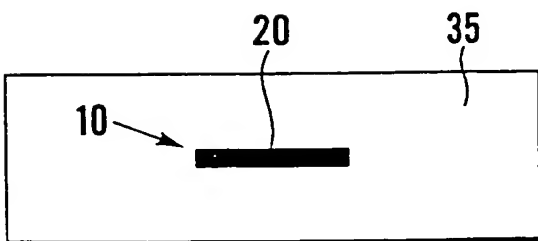


Fig. 4a

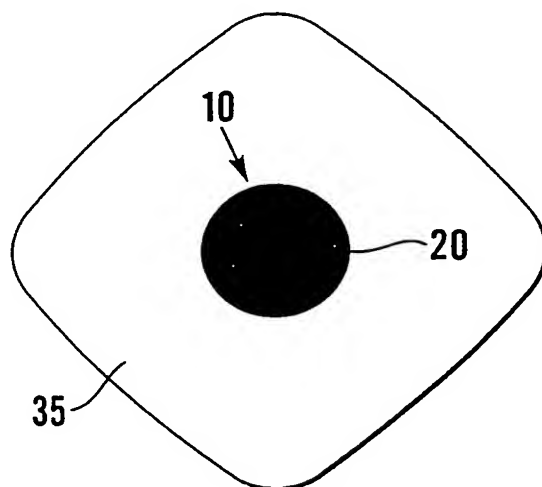


Fig. 4b

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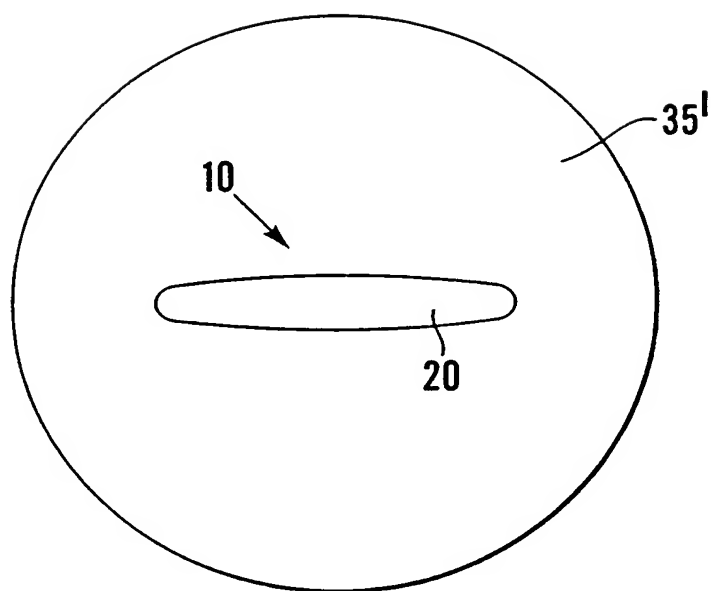


Fig.5